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ABSTRACT

Some characteristics of inquiry training which make it applicable to geography instruction are described. The first section reviews various conceptual approaches and provides frameworks for the study of inquiry teaching. The second section presents two case studies which illustrate inquiry teaching approaches to a geographic study of world population distribution. The two cases represent widely divergent classroom styles, with one teacher taking a highly cognitive stance with his students and another teacher indicating more concern with development of student interests in geography. Presented for each of the class types are six beginning inquiry activities, eight inquiry process techniques, and three inquiry debriefing techniques. Sample techniques include focus setting, clarifying, suggesting and designing an operation, identifying inquiry processes, probing for intent or function, and probing for student's theory. The third section identifies some limitations of inquiry teaching such as lack of suitable evaluation instruments, insufficient teacher preparation in effective uses of inquiry training, limited curriculum materials, and poor dissemination of existing materials. References are included. (Author/DB)

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Colin J. Marsh

"INQUIRY TEACHING: SOME APPLICATIONS FOR GEOGRAPHY TEACHERS".

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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INTRODUCTION

Whether we enthusiastically support it or not, inquiry teaching is very much a part of the education scene of the 1970's. Inquiry now seems to adorn all new textbook materials, program packages and pronouncements from the state education departments.[1] Yet do we really understand the term? It seems to be yet another of those elusive concepts like open education and democratic teaching to which proponents have ascribed a plethora of interpretations.

Academics have tended to use a number of related terms rather loosely when describing inquiry teaching. One assumes at first glance that these terms are all synonymous but a closer examination reveals that this is not the case. For example, discovery was a term refurbished by Bruner in his book, The Process Of Education.[2] Subsequently, this term has been widely used by science and mathematics educators to describe an inductive learning approach in their respective disciplines. However, the discovery approach focusses on the procedures leading up to the solving of the problem according to Gage[3] and only to the final "aha" breakthrough according to Suchman.[4] The inquiry teaching approach is more than a set of procedural elements and so these two terms are not synonymous. It can also be shown that other purported synonyms for inquiry teaching such as inductive thinking, critical thinking and problem solving cannot be substantiated.

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A more useful approach may be to concentrate on several unique characteristics of inquiry teaching rather than searching for commonalities between related concepts. For example, two such characteristics might be:

a) that students undertake active thinking operations on an issue;

b) that students involved in varying levels of decision making with regard to procedures to be selected and data (content) to be utilised.

These aspects of inquiry teaching will be elaborated more fully in a subsequent section of the paper. Of course, a caveat should be expressed that inquiry teaching is only part of any teachers' repertoire of skills. There are classroom situations when didactic teaching is most appropriate and other situations when socratic, discussion and recitation methods are admirably suited. No one method can be maintained as a steady diet with the one group of students. Rather, the plea being made here is that inquiry teaching be considered as an addition to one's teaching repertoire.[5]

CONCEPTUAL APPROACHES TO INQUIRY TEACHING

A number of books, theses and articles have been written about inquiry teaching in general, and to a lesser extent, about its application to the teaching of geography. These writers have produced various conceptual structures of inquiry teaching, many of which provide valuable insights about the term.

Ryan and Ellis suggest that inquiry teaching is concerned with data-oriented activities.[6] To them, the sequence of operations is one of major importance and they go to considerable lengths to emphasize the student activities of generating and processing data and making references. The teacher's task is to create the initial prod to students via the posing of research-oriented questions and the provision of all kinds of creative resource materials. They concede that inquiry teaching can vary widely from teacher dependency through teacher guidance to teacher independent situations and suggest that these might normally occur for the school years 1-5, 4-8 and 7-12 respectively. Some limited comments are also made about the importance of supportive classroom atmosphere.[7] Overall, it appears that these authors have conceptualised inquiry teaching as a data searching/data generating operation and are less concerned with teaching styles or classroom atmosphere.

Massialas, Sprague and Hurst take a different approach in their exposition of inquiry teaching.[8] To them, the classroom atmosphere is of fundamental importance for the development of productive inquiry.

They differentiate between student activities which are opinion based and those which require deeper probing and the grounding of beliefs. "Opining teaching" where teachers and students merely exchange opinions and comments is not true inquiry teaching.[9] Students undertake the process of inquiry so as to clarify their values, using evidence to validate their positions and to explore the logical consequences of these stands. Consequently, reflective approach to inquiry can only be undertaken in a supportive, trusting, classroom environment in which participants feel willing to expose their beliefs and attitudes.

Morine and Morine provide an elaborate conceptual framework consisting of three basic inquiry approaches of induction (open, structured), deduction (simple, semi, hypothetico) and transduction.[10] It is the task of the teacher to select the approach most appropriate to a given level of students and subject matter. In practice, this may be a difficult if not impossible task for the classroom teacher. However, the authors inclusion of transductive thinking in which students are encouraged to relate dissimilar objects and persons, provides a creativity dimension worthy of inclusion in inquiry teaching.

Beyer provides yet another approach to inquiry teaching.[11] He recognises that there are a number of stages in the inquiry process which he labels as:-

1. Defining a purpose.
2. Developing a tentative answer.
3. Testing the tentative answer.
4. Drawing a conclusion.
5. Applying the conclusion in new data.

In addition, he takes a very pragmatic look at the attitudes and behaviour of the teacher and students in the classroom situation. He maintains that all inquiry participants need to uphold such attitudes and values as objectivity, respect for evidence, respect for the use of reason, tolerance for ambiguity and willingness to suspend judgment and curiosity.[12] It is also suggested that content (knowledge) should be viewed as someone's interpretations, and that it is changing and very tentative.

The four approaches described above provide some interesting but rather conflicting conceptual frameworks for the study of inquiry teaching. Approaches to inquiry teaching are useful, but incomplete.

An alternative framework is presented in Figure 1, which incorporates the three dimensions of an inquiry atmosphere, a procedural continuum and a content continuum.

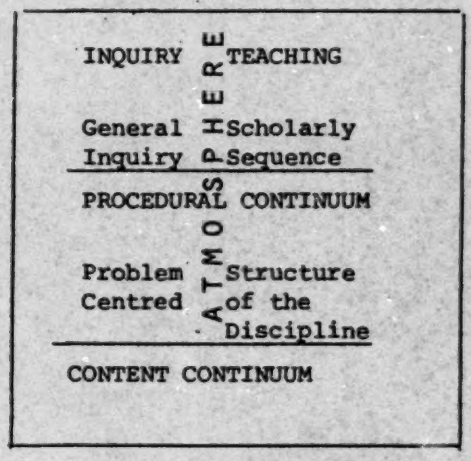


FIG.I

A stimulating inquiry atmosphere is an essential for successful inquiry teaching and consequently this permeates the entire model. There is also the need for some form of inquiry procedures or inquiry process. In Figure 1, this is depicted as a continuum to indicate the structuring variations that could occur. Some teachers might operate quite successfully with very few inquiry procedures. Vincent Rogers points to the value of having at least some educational experiences that are not goal oriented, in which students inquire merely because they have an impulse to do so.[13] Alternatively, some teachers might prefer working at a very high level of prescription whereby students are required to undergo a precise number of procedural steps (indicated on the extreme right of the procedural continuum).

The content continuum is also an important component of any conceptual framework. Content (knowledge) can be used in a completely non-structured way by students whereby they collect relevant data from any source, regardless of discipline boundaries or sequence (extreme left of the content continuum). Alternatively, structure of the discipline adherents would maintain that students must use concepts from specific disciplines within a carefully designed sequence.

Two other assumptions about this conceptual framework need to be made. The two continuums represent, in effect, different levels of inquiry teaching from autonomous self-directed learning to teacher-directed learning. Each teacher and his group of students need to decide upon which level they wish to interact. This will vary with the background levels, interests and abilities of both the teacher and his students and so ideally, it should be discussed in advance by both parties. A second assumption refers to the need for a teacher and his group to follow parallel positions on both the procedural and content continuums. That is, students working with carefully sequenced content concepts would benefit most from adhering to rigidly prescribed procedural activities. This parallel relationship applies to any positions on the two continuums.

It is suggested that this conceptual framework furnishes the classroom teacher with a high degree of flexibility in that he can select any one of a number of inquiry approaches, provided activities are selected which are consistent for both the procedural and content continuums. To illustrate the model, let us consider two inquiry teaching approaches to a geographical study of World Population Distribution.

TWO CASE STUDIES

Teacher X takes a highly cognitive stance with his students. He maintains that geography concepts need to be carefully isolated and thoroughly reinforced. All his classroom activities are carefully sequenced so that students will have precisely the learning experiences he has devised. (Example A).

Teacher Y is more concerned with the development of student interests in geography. She considers that an understanding of different cultures and their environments can be best achieved through an exploration of feelings and attitudes. (Example B).

In both examples, it is necessary for the teachers concerned to develop a stimulating inquiry atmosphere within their classroom. Physical resources can be arranged within a classroom which will greatly foster inquiry. For example, these might include maps,

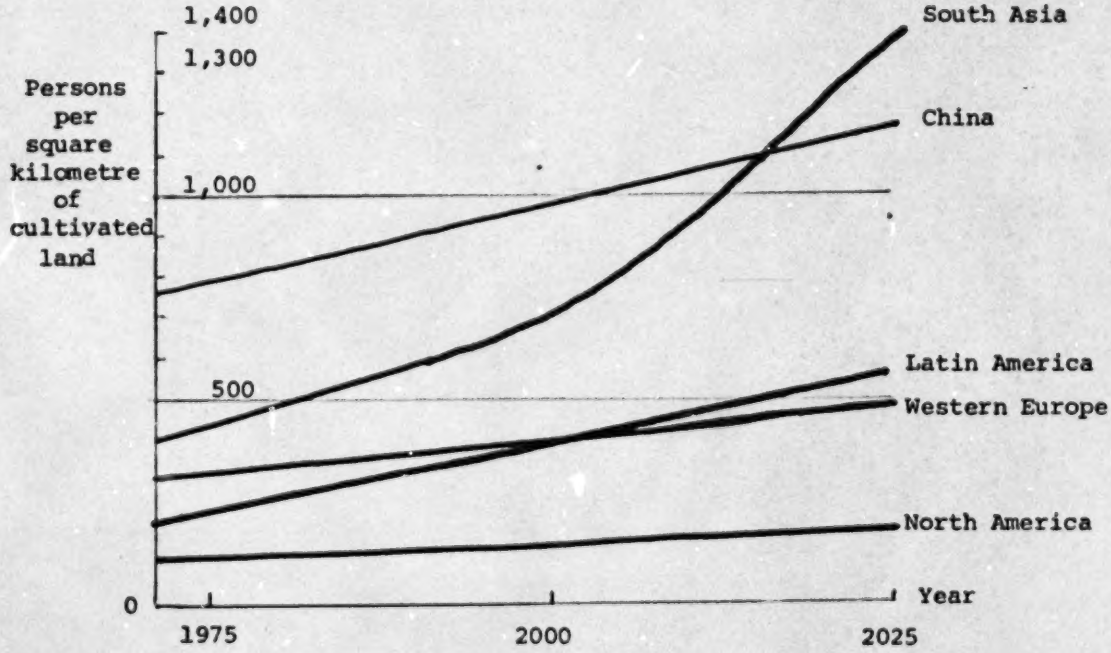
magazines, newspapers, study prints, documents, directories, census reports and artifacts. However, it is the quality of the socio-psychological interactions within the classroom that are of paramount importance. In Example A, it would appear that acceptable modes of behaviour might include individual diligence and the achievement of cognitive tasks, while in Example B, open discussion and the airing of beliefs and attitudes might be of major concern for all class members.

a) Inquiry Springboard.

Most inquiry teaching activities necessitate some use of thought provoking springboards to get students involved in an issue and to encourage them to generate relevant hypotheses. Consider the following springboards on World Population Distribution. The first springboard may be more appropriate with the Example A class and the second with the Example B class.

Inquiry Springboard 1 - World Population Distribution.

(Teacher X) "Take a close look at the following graph. What are the relationships between population numbers and cultivated land?"



Estimated Population per Cultivated Land

FIG. 2

Inquiry Springboard II - World Population Distribution

(Teacher Y) "Do you realise that by the Year 2000, if we go on as we are, we shall have run out of the world's arable land; it will all be used up with none to spare. Furthermore, the amount available decreases each day, as half a million acres of farming land disappears under concrete highways and buildings."

b) Maintaining Inquiry Activities With a Class.

Few students are sufficiently self-motivated to be able to maintain inquiry activities without some guidance.[14] Some students may need assistance in overcoming a lack of data or may need help in the reformulation of an hypothesis. The following three tables provide a series of teaching techniques that might be used with Examples A and B mentioned above.

A number of inquiry starters are listed in Table I. As indicated in the Example A column, the teacher may desire his students to focus upon the factual implications of the population graph. His inquiry starter techniques might include structuring the tasks to be accomplished, clarifying individual tasks and responding to specific inquiries as requested. These techniques would support the student's efforts in the preliminary stages and thereby facilitate their task of completing the exercise. The Example B class might also need some inquiry starters as indicated in the second column of Table I. The focussing provided by this teacher is likely to be directed to the personal issues of over-population and to the eliciting of specific values about poverty and standard of living.

Table 2, lists a number of inquiry process techniques that might be use by a teacher during the activity. With the Example A class it can be seen that the teacher's questions and comments are directed towards the compilation of appropriate factual data to test the hypotheses.

Table 1.

SOME INQUIRY STARTERS *

Specific Techniques	Example A class	Example B class
1. Focus setting:	Establish the statement that cultivable land is insufficient for present population numbers. (Focus will be on factual data to support or refute the statement).	Establish the statement that cultivable land is insufficient for present population numbers. (Focus will be on the meaning of the population dilemma).
2. Structuring:	Specify what regions, continents, global studies will be undertaken and in what sequence.	How important is this issue to you personally, to your family, to your country?
3. Clarifying:	"Harry, do you think that the U.N. Demographic Yearbook will provide us with all the data we need?"	"Sally, are you suggesting that this is a population problem rather than a resource problem?"
4. Accepting:	"That's a useful way to begin to look at the problem, Jack."	"Yes Jennifer, perhaps it is necessary to define the meaning of 'cultivable land'."
5. Responding to students' data probe:	"Yes Tom, you may need to use the wider range of references in the State Library".	"If that is an important issue for you Alan then perhaps you should study it first."
6. Teacher silence	(Deliberate pauses, wait-time effects).	(Deliberate pauses, wait-time effects, non-directive stance by teacher).

* Adapted from B. Strasser, Teaching Toward Inquiry, National Education Association, 1971, pp.50-51.

The teacher probes help to maintain a high level of student activity. Similar supportive techniques are used with the Example B class although it is evident that individual students are allowed more opportunity to follow their own initiatives.

Table 2.

SOME INQUIRY PROCESS TECHNIQUES *

Specific Techniques	Example A class	Example B class
7. Probe for data:	How can we check on the accuracy of the statement that there is insufficient cultivable land to support population numbers. What data do we need?	"Where do we start with this statement?"
8. Probe for operations:	"Is the data in the Yearbooks sufficient to test out the accuracy of the statement?"	"What kinds of data do we need?"
9. Suggesting an operation:	"You might look up an Atlas which depicts cultivable land in all continents . . . ."	"Alan suggests that we need to consider cultural differences in eating habits and standards of living. What do the rest of you think?"
10. Designing an operation:	"You will need to obtain specific areas of cultivable land in all continents together with corresponding population figures. You must also consider the effects of technological advances in food production."	"When you have decided who is working with you, let me know. Sign the book near the door if you are collecting data away from the home room."
11. Identifying inquiry processes:	"John, your idea of increased irrigation technology adds some new input data."	"George, why did you become so interested in the Green Revolution? Has it helped you with your theory?"
12. Identifying products of inquiry:	"John, does your irrigation technology data warrant a change in our hypothesis?"	"As a result of your data, George, do you want to guide us on a different plan of attack?"
13. Probe for intent or function:	"Shirley, did the data from that movie film support or refute our theory?"	"Alison, does the data that you have collected, make you feel more optimistic or pessimistic about the future?"
14 Probe for prediction or explanation:	"Is our theory less plausible if we consider synthetic foods?"	"Do you feel more optimistic about the dilemma now? What should be our next moves? Who can give us some leads?"

* Adapted from B. Strasser, Teaching Toward Inquiry, National Education Association, 1971, pp.54-55.

Table 3.

SOME INQUIRY DEBRIEFING TECHNIQUES *

Specific Techniques	Example A class	Example B class
15. Probe for student's theory:	"Bob, could you explain how your data on standard of living affects our theory?"	"Dick, can you give us some feedback on your theory?"
16. Probe for status of student's theory:	"Jill, are you satisfied with our final hypothesis? What evidence does it tend to overlook?"	"Sharon, are you satisfied with your theory? What kinds of data would bring it down?"
17. Probe for feelings:	"Were you satisfied with the type of data we could locate? What kinds of data did you want to use but were unable to find?"	"What did you achieve? What do you feel needs to be done from here?"

* Adapted from B. Strasser, Teaching Toward Inquiry, National Education Association, 1971, pp.58-59.

In Table 3 some inquiry debriefing techniques are listed. It is most desirable that students have an opportunity to review their actions and achievements, especially in the light of what other small groups have achieved. They need time to reflect upon the viability of their research, and to analyze those activities which they found to be most fruitful. Some teacher probes to assist with this debriefing activity are listed in Table 3 for the Example A and Example B classes.

Some Limitations of Inquiry Teaching

Inquiry teaching can take many forms and in this paper it was only possible to describe two specific classroom styles. The recent, commercially produced curriculum packages add greatly to the classroom teachers' choice of appropriate inquiry approaches.

It is always difficult to predict the duration of any educational innovation but inquiry teaching is certainly compatible with current school trends of greater flexibility per individual student via wider elective choices, variable scheduling and multi-media resource packages. With these trends gaining momentum, it is

unlikely that inquiry teaching will diminish in popularity in the foreseeable future.

However, little research evidence is available about the overall effectiveness of inquiry teaching. A recent survey of twenty-eight research studies revealed that in only thirteen cases were significantly higher results obtained from inquiry teaching.[15] One of the major difficulties arise from the lack of suitable evaluation instruments to measure such inquiry learning qualities as creativity, initiative and perseverance. Perhaps we are caught up in the "rearview mirror" syndrome and are overly concerned about whether inquiry teaching approaches will accomplish the goals that earlier teaching methods tried to achieve, rather than concentrating on individual student development through inquiry approaches.[16]

There is little doubt that preservice and inservice teachers are insufficiently prepared to use inquiry teaching effectively. Most of the curriculum packages stipulate a particular inquiry approach which is maintained throughout the units.[17] This is useful for the teacher uninitiated into inquiry approaches but it is also very limiting. They need to be aware of a number of approaches so that they can adapt materials and methods to suit specific teaching situations. Workshop sessions are often valuable opportunities for classroom teachers to experiment with curriculum materials.

For example, Gunn indicates that teachers in four different countries have produced their own versions of the Portsville simulation from the H.S.G.P. package.[18] The Social Education Materials Project is now at the stage of trialling a number of exciting resource packages for high school teachers. It would seem crucial for the success of this project that adequate attention is given to workshop training sessions including the development of inquiry teaching exemplars so that classroom teachers will have the background to use these new materials effectively.[19]

The acceptance of inquiry teaching into Australian schools requires the concerted effort of enthusiasts. Some teachers talk about inquiry teaching but never practice it. Commercial publishers prefer the higher gains from traditional textbook sales. If we believe that the inquiry approach does provide our students with greater learning opportunities, then it is up to us as geography educators to carry the message into schools with missionary zeal.

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